

## SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for window walls.
3. Storefront framing for punched openings.
4. Exterior and interior manual-swing entrance doors and door-frame units.

- B. Related Sections:

1. Division 08 Section "Louvers And Vents" for units installed with aluminum-framed systems.

#### 1.3 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
  - a. Deflection exceeding specified limits.
  - b. Thermal stresses transferring to building structure.
  - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
  - d. Glazing-to-glazing contact.
  - e. Noise or vibration created by wind and by thermal and structural movements.
  - f. Loosening or weakening of fasteners, attachments, and other components.

- g. Sealant failure.
    - h. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
  - 1. Wind Loads:
    - a. Design pressure based on IBC and ASCE 7-8.
    - b. Basic Wind Speed: 90 mph (40 m/s).
    - c. Importance Factor: 1.15.
    - d. Exposure Category: B.
- D. Deflection of Framing Members:
  - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
  - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
  - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506.
  - 1. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
  - 2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet (9.1 m) above grade.
- G. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.
  - 1. Design Displacement: As indicated on Drawings.

2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.
- H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
- I. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- J. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
1. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- K. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
    - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
  3. Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- L. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 69 when tested according to AAMA 1503.
- M. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K) when tested according to AAMA 1503.

- N. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
  - 1. Sound Transmission Class (STC): Minimum 26 30 35 <Insert rating> STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
  - 2. Outdoor-Indoor Transmission Class (OITC): Minimum 26 30 34 <Insert rating> OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- O. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
  - 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
  - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- P. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
  - 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.

5. Flashing and drainage.

F. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

H. Qualification Data: For qualified Installer and testing agency.

1.6

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise or modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

C. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures including, but not limited to, excessive deflection.
- b. Noise or vibration caused by thermal movements.
- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- d. Adhesive or cohesive sealant failures.
- e. Water leakage through fixed glazing and framing areas.
- f. Failure of operating components.

- 2. Warranty Period: Two years from date of Substantial Completion.

- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

- 1. Warranty Period: 20 years from date of Substantial Completion.

## 1.10 MAINTENANCE SERVICE

- A. Entrance Door Hardware:

- 1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
- 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. EFCO Corporation.
  2. Kawneer North America; an Alcoa company.
  3. Pittco Architectural Metals, Inc.
  4. United States Aluminum.
  5. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

### 2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
  2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
  3. Extruded Structural Pipe and Tubes: ASTM B 429.
  4. Structural Profiles: ASTM B 308/B 308M.
  5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

### 2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Nonthermal for interior applications Thermally broken for exterior applications.
  2. Glazing System: Retained mechanically with gaskets on four sides unless noted otherwise.
  3. Glazing Plane: Center or as indicated .
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  2. Reinforce members as required to receive fastener threads.
  3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system for interior applications, fabricated from stainless steel for exterior applications.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
    - a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - b. Color: Clear or as selected by Architect from manufacturer's full range of colors.
  2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.



- a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- b. Color: Matching structural sealant.

## 2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
  2. Door Design: Wide stile; 5-inch (127-mm) nominal width bottom rail minimum 10 inches.
    - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.
    - b. Bottom Rail: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.
    - c. Top Rail: 6 inches (152 mm).
  3. Glazing Stops and Gaskets: Beveled snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

## 2.6 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
  1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.
  - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using shear-block system head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At exterior doors, provide compression weather stripping at fixed stops.
  - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 or thicker.

1. Color: Champagne unless noted otherwise.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

##### A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

##### B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

##### C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

##### D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

##### E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

##### F. Install glazing as specified in Division 08 Section "Glazing."

##### G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

- H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

### 3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
  1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
  2. Alignment:
    - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
    - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

### 3.4 FIELD QUALITY CONTROL

### 3.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
  1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

### 3.6 ENTRANCE DOOR HARDWARE SETS

Submit Door Hardware Schedule.

END OF SECTION 084113

## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Solid-core doors and transom panels with wood-veneer and plastic-laminate faces.
- 2. Factory finishing flush wood doors.
- 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- 4. Only solid wood (staved) core doors or structural composite lumber doors are acceptable, per latest UMCP Design Criteria/Facility Standards Manual.

- B. Related Sections:

- 1. Division 06 Section "Interior Finish Carpentry, Interior Architectural Woodwork" for wood door frames including fire-rated wood door frames.
- 2. Division 08 Section "Glazing" for glass view panels in flush wood doors.
- 3. Division 09 Sections "Exterior Painting," "Interior Painting," and "Staining and Transparent Finishing" for field finishing doors.
- 4. Division 8 section "Hollow Metal Doors and Frames", and "Aluminum Frames".

#### 1.3 SUBMITTALS:

- A. Coordination of submittals: Submit all division 8 schedule and product data (including but not limited to steel door, steel frame, wood door, door hardware, hollow metal, and aluminum frames) to allow simultaneous review by architect. Review will not begin prior to receipt of each so these submittals.
- B. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
  - 1. Indicate dimensions and locations of mortises and holes for hardware.
  - 2. Indicate dimensions and locations of cutouts.
  - 3. Indicate requirements for veneer matching.
  - 4. Indicate doors to be factory finished and finish requirements.

5. Indicate fire-protection ratings for fire-rated doors.
- D. Samples for Verification: For custom finishes.
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
  2. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.
  3. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
    - a. Provide samples for each species of veneer and solid lumber required.
    - b. Provide samples for each color, texture, and pattern of plastic laminate required.
    - c. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
  4. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
  5. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.
- E. Warranty: Sample of special warranty.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.
- C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
1. If requested, provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
  2. Comply with NWKIDA I. S. I. A. , "Architectural flush Wood Doors."
- D. Forest Certification: Provide doors made with cores or veneers not less than 70 percent of wood products or all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure or as close to neutral pressure as possible according to NFPA 252 UBC Standard 7-2 or UL 10B, UL 10C.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard

construction requirements for tested and labeled fire-rated door assemblies except for size.

2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

- F. Preinstallation Conference: Conduct conference at Project site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  3. Warranty Period for Solid-Core Exterior Doors: Five years from date of Substantial Completion.
  4. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Buell Door Company
4. Graham; an Assa Abloy Group company.
5. Marshfield Door Systems, Inc.
6. Mohawk Flush Doors, Inc.; a Masonite company.
7. Oshkosh Architectural Door Company.
8. VT Industries Inc.

## 2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty or Heavy Duty.
- C. WDMA I.S.1-A Performance Grade:
  1. Heavy Duty unless otherwise indicated.
  2. Extra Heavy Duty: Classrooms, **public toilets, janitor's closets, assembly spaces, exits** and where indicated.
- D. Structural-Composite-Lumber-Core Doors:
  1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf (3100 N).
    - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- E. Fire-Protection-Rated Doors: Provide core specified for non rated doors in 2.2 as needed to provide fire-protection rating indicated.
  1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile, with standard laminated edge construction.
  2. Stiles : Provide stiles with improved screw – holding capacity and split resistance and with outer stile matching face veneer.
  3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges. Pair of doors to be book-matched
- F. Mineral-Core Doors: Will not be accepted.
- G. Hollow-Core Doors: Hollow-Core Doors will not be accepted.

## 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Exterior Solid-Core Doors:



1. Grade: Premium, with Grade AA faces.
2. Species: Mahogany as noted on drawings.
3. Cut: Plain sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center Balance Match
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match : Provide door faces of compatible color and grain within each area of the building.
8. Exposed Vertical and Top Edges: Same species as faces, Applied wood edges of same species as faces and covering edges of crossbands.
9. Core: Either glued wood stave or structural composite lumber.
10. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
11. Adhesives: Type I per WDMA TM-6.
12. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Interior Solid-Core Doors ;

1. Grade: Premium, with Grade AA faces.
2. Species: Select white birch or as noted.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center, Balance, Match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Provide Door faces of compatible color and grain within each area of the building.
8. Room Match: Match door faces within each separate room or area of building.
9. Transom Match: Continuous match.
10. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Division 06 Section "Interior Architectural Woodwork" and Division 06 Section "Wood Paneling."
11. Exposed Vertical and Top Edges: Applied wood-veneer edges of same species as faces and covering edges of faces.
12. Core: Glued wood stave, Structural composite lumber, Either glued wood stave or structural composite lumber.
13. Construction: **Five** plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press. Stiles – same species as faces.
14. Construction: Seven plies, either bonded or nonbonded construction.
15. WDMA I.S.1-A Performance Grade: Heavy Duty As indicated.

2.4 DOORS FOR OPAQUE FINISH

A. Exterior Solid-Core Doors :

1. Grade: Premium.
2. Faces: Mahogany or as noted.

3. Exposed Vertical and Top] Edges: Any closed-grain hardwood.
4. Core: Either glued wood stave or structural composite lumber.
5. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
6. Adhesives: Type I per WDMA TM-6.
7. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Interior Solid-Core Doors :

1. Grade: Premium.
2. Faces: Mahogany, Red Oak, or as noted.
  - a. Apply medium-density overlay to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
  - b. Hardboard Faces: AHA A135.4, Class 1 (tempered).
  - c. MDF Faces: ANSI A208.2, Grade 150 or 160.
3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Core: Either glued wood stave or structural composite lumber.
5. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
6. Construction: Seven plies, bonded construction.
7. WDMA I.S.1-A Performance Grade: Heavy Duty.

## 2.5 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors :

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS, Grade HSH.
3. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products, or as indicated.
4. Exposed Vertical and Top Edges: Plastic laminate that matches faces, applied before faces; Impact-resistant polymer edging, applied after faces.
  - a. Polymer Edging Color: Same color as faces.
5. Core: Either glued wood stave or structural composite lumber.
6. Construction: Three plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces are applied. Faces are bonded to core using a hot press.
7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.
8. WDMA I.S.1-A Performance Grade: Heavy Duty.

## 2.6 LOUVERS AND LIGHT FRAMES

A. Wood Louvers:

1. Wood Species: Same species as door faces.
  2. Profile : Flush Rectangular Beads.
  3. At 20 minute fire rated wood - core doors, provide wood beads and metal glazing clips approved for such use.
- B. Metal Louvers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Air Louvers Inc.
    - b. Anemostat; a Mestek company.
    - c. L & L Louvers, Inc.
    - d. LL Building Products, Inc.; a division of GAF Materials Corporation.
    - e. Louvers & Dampers, Inc.; a Mestek company.
    - f. McGill Architectural Products.
  2. Blade Type: Vision-proof, inverted V, or as noted.
  3. Metal and Finish:
    - a. Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.
    - b. Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.
    - c. Extruded aluminum with Class II, color anodic finish, AA-M12C22A32/A34. Submit color samples for selection by architect.
- C. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Air Louvers Inc.
    - b. Anemostat; a Mestek company.
    - c. Hiawatha Incorporated.
    - d. L & L Louvers, Inc.
    - e. LL Building Products, Inc.; a division of GAF Materials Corporation.
    - f. Louvers & Dampers, Inc.; a Mestek company.
    - g. McGill Architectural Products. Submit color samples for selection by architect.
  2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish. Submit color sample for selection by architect.
- D. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
1. Wood Species: Same species as door faces.
  2. Profile: Flush rectangular beads.

3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- E. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- F. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated. Submit color sample for selection by architect.

## 2.7 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
  1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Cut and trim openings through doors in factory.
  1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
  3. Louvers: Factory install louvers in prepared openings.
- E. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before shop priming.
  1. Flash top of outswinging doors (with manufacturer's standard metal flashing).

## 2.8 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory.
- C. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
- D. Finish doors at factory where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: AWI conversion varnish or catalyzed polyurethane system.
  - 3. Staining: As selected by Architect from manufacturer's full range.
  - 4. Sheen: Satin.
  - 5. Dye: Where noted on drawings to be dyed, door to be colored with water soluble dye to match sample supplied by architect.
- F. Opaque Finish:
  - 1. Grade: Premium.
  - 2. Finish: AWI conversion varnish or catalyzed polyurethane system.
  - 3. Color: As selected by Architect from manufacturer's full range.
  - 4. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
  - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors (allowed only in existing frame, or where knock – down frames are required) : Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
  - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
  - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

## SECTION 08710 - DOOR HARDWARE

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Work under this section comprises of furnishing and installing door hardware needed for a complete and operational system, including interface with electrified hardware components and access controls systems supplied by Owner.
- B. Section Includes:
  - 1. Hinges
  - 2. Locksets, latchsets, and cylinders
  - 3. Exit devices
  - 4. Closers
  - 5. Flush bolts
  - 6. Push plates - pulls
  - 7. Kick, mop and protection plates
  - 8. Stops, wall bumpers, overhead holders
  - 9. Electrified hold open devices
  - 10. Thresholds, gaskets, weather seals, and door bottoms
  - 11. Miscellaneous trim and accessories
  - 12. Electro-mechanical hardware devices, access controls, power supplies, and electrical peripherals necessary to meet requirements of security, fire and egress codes
- C. Related Sections:
  - 1. Section 08110 Steel Doors and Frames
  - 2. Section 08211 Wood Doors
  - 3. Section 08411 Aluminum -Framed Storefronts
  - 4. Requirements of this section also apply to electrical installations. Refer to work specified in Divisions 16 for other requirements and limitations applicable to electrified hardware items, including, but not limited to:
    - a. Conduit
    - b. Junction boxes
    - c. Wiring
    - d. Final connections

#### 1.02 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
- B. American National Standards Institute:
  - 1. ANSI A156 Series
  - 2. ANSI A115W Wood Door Hardware Standards; Hardware Preparation
  - 3. ANSI A115 Specifications for Steel Door and Frame Preparation for Hardware
  - 4. ANSI A117.1 Accessible and Usable Buildings and Facilities
- C. Door and Hardware Institute:
  - 1. DHI Publication - Abbreviations and Symbols
  - 2. DHI Publication - Basic Architectural Hardware
  - 3. DHI Publication - Hardware for Labeled Fire Doors (with supplements)

4. DHI Publication - Hardware Reinforcements on Steel Doors and Frames
  5. DHI Publication - Installation Guide for Doors and Hardware
  6. DHI Publication - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
  7. DHI Publication - WDHS-1 Template Book Criteria for Wood Doors
  8. DHI Publication - WDHS-3 Recommended Hardware Locations for Wood Flush Doors
  9. DHI Publication - For Processing Hardware Schedules and Templates
- D. National Fire Protection Association:
1. NFPA 80 Standard for Fire Doors and Windows
  2. NFPA 101 Life Safety Code
  3. NFPA 105 Recommended Practice for the Installation of Smoke-Control Door Assemblies
  4. NFPA 252 Standard Methods of Fire Tests of Door Assemblies
- E. Underwriters Laboratories, Inc.
1. UL Standard 10C Fire Tests of Door Assemblies
  2. UL Standard 1784 Air Leakage Tests of Door Assemblies
  3. UL Building Materials Directory

### 1.03 SUBMITTALS

- A. Product Data:
1. Submit manufacturer's literature describing products to be provided.
- B. Shop Drawings:
1. Before ordering or delivery of hardware, submit 3 copies of hardware schedule.
    - a. Supplier shall assume sole responsibility for provision, proper coordination and function of finish hardware needed for openings, whether or not listed in schedule below.
  2. Hardware schedule shall be in a vertical form, organized into hardware sets indicating complete designations of every item needed for each door or opening. Indicate location of hardware set, cross-referenced to indications in Contract Documents, manufacturer's name and product number, finish, and other similar information describing hardware to be provided. Schedule shall include information as follows:
    - a. Type, style, function, and size of each item of hardware
    - b. Fastenings and other pertinent information
    - c. Explanation of abbreviations, symbols, codes, etc. contained in schedule
    - d. Mounting locations for hardware
    - e. Door and frame materials
  3. Provide, as part of Hardware Schedule, a door index listing openings by number with corresponding page and heading numbers.
  4. Submit 3 copies of keying schedule prior to ordering hardware.
  5. Electro-Mechanical Hardware:
    - a. Provide complete point-to-point wiring diagrams for each opening needing electrified hardware, except openings where only magnetic hold-opens are specified. Provide a copy with each hardware schedule submitted.
    - b. Electrical components to be listed by opening in hardware submittals.
    - c. Provide elevation drawings of electronic hardware and systems identifying locations of system components with respect to their placement in door opening. Provide a copy with each hardware schedule submitted.
  6. Shop drawings submittal shall be coordinated with shop drawings submission of related portions of Work, such as:
    - a. Metal doors and frames



- b. Wood doors
- c. Entrances and storefronts
- 7. Hardware schedule shall be prepared under supervision of a Certified Door Consultant (CDC) and shall bear AHC or CDC Seal of Door and Hardware Institute.
- C. Samples:
  - 1. Submit samples of door hardware items if requested by Architect / Owner. Accepted samples may be incorporated into Work.
  - 2. Samples submitted shall be of production type and shall represent minimum quality of work to be furnished by manufacturer. No work represented by samples shall be fabricated until samples are accepted. Downgrading of quality demonstrated by samples may be cause for rejection of work.
- D. Quality Assurance Submittals:
  - 1. Certifications:
    - a. Submit information needed to indicate compliance with specifications.
    - b. Submit a statement from manufacturer that electronic hardware and systems being supplied comply with operational descriptions exactly as specified.
  - 2. Manufacturer's Instructions:
    - a. Furnish templates and schedules needed for fabrication of hollow metal doors and frames, wood doors and frames, and other items related to hardware.
    - b. Submission for templates and template list shall follow procedures established by DHI publication *For Processing Hardware Schedules and Templates*.
- E. Close-out Submittals:
  - 1. Wiring Diagrams:
    - a. Prepare complete point-to-point wiring diagrams for electronic components listed by opening in hardware submittals.
    - b. Include a copy of wiring diagrams in Operation and Maintenance Data Manual.
  - 2. Elevation Drawings:
    - a. Prepare elevation drawings for mounting heights and locations of electronic components listed by opening in hardware submittals.
    - b. Include a copy of operational descriptions in Operation and Maintenance Data Manual.
  - 3. Operational Descriptions:
    - a. Provide complete operational descriptions of electronic components listed by opening in hardware submittals.
    - b. Operational descriptions shall detail how each electronic component functions within opening incorporating conditions of ingress and egress.
    - c. Include a copy of operational descriptions in Operation and Maintenance Data Manual.

#### 1.04 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Hardware supplier shall be a qualified direct distributor of products to be furnished, specializing in distribution of contract hardware for a period of at least 5 years. Supplier shall maintain a warehouse facility within 100 miles of Project.
  - 2. Supplier shall have on staff a full time employee who is a member in good standing of Door and Hardware Institute and an Architectural Hardware Consultant (AHC) or a person of equivalent experience. Employee shall be made available at reasonable times to consult with Architect, Contractor, and/or Owner regarding matters affecting finish hardware.

3. Installer shall be trained or qualified by manufacturer in installation techniques and procedures of door hardware and shall demonstrate a minimum of 3 years successful experience in such installation.
  4. Regardless of types specified or shown on details, provide gaskets and seals that do not interfere with ratings and proper operation of fire-rated openings and emergency exits. Provide components that comply with requirements of such openings.
  5. Single Source Responsibility:
    - a. To greatest extent possible, obtain each type of hardware (i.e. latchsets, locksets, hinges, closers, etc.) from a single manufacturer.
    - b. Provide secondary materials that are produced or are specifically recommended by manufacturer to ensure compatibility.
- B. Regulatory Requirements:
1. Hardware and installation shall comply with American National Standards Institute (ANSI), National Fire Protection Association (NFPA), Underwriters Laboratories (UL), Builders Hardware Manufacturers Association (BHMA), and Door and Hardware Institute (DHI) provisions or standards listed below. Provide products complying with these standards as specified elsewhere in this section.
  2. Federal Accessibility Regulations:
    - a. Americans with Disabilities Act - ADA
    - b. Uniform Federal Accessibility Standards - UFAS
    - c. ANSI A117.1 Standard *for Accessible and Usable Buildings and Facilities*
  3. National Fire Protection Association:
    - a. NFPA 80 Standard *for Fire Doors and Windows*
    - b. NFPA 101 Life Safety Code
    - c. NFPA 105 *Recommended Practice for the Installation of Smoke-Control Door Assemblies*
    - d. NFPA 252 *Standard Methods of Fire Tests of Door Assemblies*
  4. Underwriters Laboratories Inc.:
    - a. UL 10C
    - b. UL 1784 Air Leakage Tests of Door Assemblies
  5. ANSI/BHMA Standards
    - a. A115-W Series
    - b. A115 Series
    - c. A156 Series:
      - 1) Butts and Hinges: ANSI A156.1/BHMA 101
      - 2) Locks & Lock Trim: ANSI A156.2/BHMA 601
      - 3) Exit Devices: ANSI A156.3/BHMA 701
      - 4) Door Controls - Closers: ANSI A156.4/BHMA 301
      - 5) Auxiliary Locks: ANSI A156.5/BHMA 501
      - 6) Architectural Door Trim: ANSI A156.6/BHMA 1001
      - 7) Template Hinge Dimensions: ANSI A156.7
      - 8) Door Controls - Overhead Holders: ANSI A156.8/BHMA 601
      - 9) Power Operated Pedestrian Doors: ANSI A156.10
      - 10) Interconnected Locks & Latches: ANSI 156.13/BHMA 621
      - 11) Mortise Locks & Latches: ANSI A156.13/BHMA 621
      - 12) Closer Holder Release Devices: ANSI A156.15/BHMA 321
      - 13) Auxiliary Hardware: ANSI A156.16/BHMA 1201
      - 14) Materials & Finishes: ANSI A156.18/BHMA 1301
      - 15) Power Assist and Low Energy Operators: ANSI A156.19
      - 16) Electro Magnetic Locks: ANSI A156.23
      - 17) Delayed Egress Locks: ANSI A156.24
  6. Door and Hardware Institute:

- a. Abbreviations and Symbols
  - b. Basic Architectural Hardware
  - c. Hardware for Labeled Fire Doors (with supplements)
  - d. Hardware Reinforcements on Steel Doors and Frames
  - e. Publication - Installation Guide for Doors and Hardware
  - f. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
- C. Certifications:
1. Hardware used in labeled fire or smoke rated openings shall be listed for those types of openings and bear identifying label or mark indicating UL listing for fire and/or smoke as needed.
  2. Exit devices in non-labeled openings to be listed for panic.
- D. Pre-Installation Meetings: *may be required by owner and will be determined prior to installation.*
1. Prior to installation of hardware, including electronic hardware, arrange conference between hardware supplier, hardware installers, and related trades to review materials, procedures and coordinating related work.
  2. Conference attendees shall include Contractor, Owner's representative, Owner's security system provider, Architect, door hardware installers, and representatives of hardware supplier and/or manufacturers.
  3. Topics to be discussed at meeting shall include:
    - a. A review of Contract Documents and accepted hardware schedule shall be made and deviations or differences shall be resolved.
    - b. Applicable local building code, National Fire Protection Association (NFPA), and Underwriters' Laboratories (UL) requirements shall be reviewed and conflicts in building code, NFPA, or UL requirements and Project conditions shall be resolved.
    - c. Review items such as proper installation sequence, adjustments, attachment, and location of door hardware. If a conflict exists between what is considered proper hardware application and Contract Documents, these differences shall be defined.
  4. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
  5. Pre-installation conference shall serve to clarify Contract Documents, application requirements and what work should be completed before hardware installation can begin.
  6. Prepare and submit, to parties in attendance, a written report of pre-installation conference. Report shall be submitted within 3 days following conference.
- E. Coordination:
1. Before ordering materials, carefully examine scale, full size, and shop drawings of work requiring hardware, and verify that material selected will properly fit Work.
  2. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware. Coordinate installation of electric hinges, locks, and security devices with installation of electrical connections.
  3. Should door hardware indicated for use on Project not qualify for appropriate labeling, accessibility, function, or use because of design, or other reason, notify Architect. Hardware items scheduled for fire-rated openings shall comply with UL requirements for entire assembly.

4. Coordinate with installation of electric maglocks, and security devices with Owner's security system provider.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
  1. Deliver materials in manufacturer's original unopened packaging with labels intact.
  2. Package hardware items separately and mark each to correspond with heading numbers on hardware schedule. Pack each item complete with necessary parts and fasteners.
  3. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.
  4. Supply necessary instructions, wiring diagrams, templates, drawings, and fasteners for proper installation. Include extra fasteners.
  5. Control handling and installation of hardware items that are not immediately replaceable so that completion of Work will not be delayed by hardware losses.
- B. Storage and Protection:
  1. Store hardware delivered to a Project, but not yet installed, in a secure locked area.
  2. Control handling and installation of hardware items that are not immediately replaceable so that Work will not be delayed by hardware losses both before and after installation.

1.06 SEQUENCING

- A. Parts of finish hardware needed by frame or door manufacturers or other suppliers in order to produce doors or frames shall be sent to those suppliers in a timely manner, so as not to interrupt job progress.

1.07 SPECIAL WARRANTY

- A. Furnish a written warranty covering cost to repair or replacement of defective materials or workmanship for periods not less than as indicated from Date of Substantial Completion.
  1. Door closers - 10 years
  3. Exit devices - 3 years

**PART 2 PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A. Hinges:
  1. McKinney
  2. Ives
  3. Hager
- B. Continuous Hinges:
  1. Hager
  2. Ives
  3. Markar
- C. Locksets, Latchsets, and Cylinder Housings:
  1. Schlage
  2. Corbin-Russwin

- D. Exit Devices, Mullions & Power Transfers:
  - 1. Von Duprin
- E. Overhead Closers:
  - 1. LCN
- G. Push Plates, Pull Bars, and Grips:
  - 1. Hager
  - 2. Ives
  - 3. Trimco
- H. Door Protection Devices:
  - 1. Hager
  - 2. Ives
  - 3. Trimco
- I. Stops, Silencers, Auxiliary Items, and Miscellaneous Hardware:
  - 1. Hager
  - 2. Ives
  - 3. Trimco
- J. Overhead Holders/Stops:
  - 1. Architectural Builders Hardware Mfg. Inc. - ABH
  - 2. Glynn-Johnson - GJ
- K. Thresholds, Door Bottoms, Seals and Stripping:
  - 1. National Guard Products Inc. - NGP
  - 2. Pemko Manufacturing
- L. Automatic Operators:
  - 1. Horton 4100LE
- M. HC Push Pad
  - 1. Sedco

## 2.02 MATERIALS

- A. General Requirements:
  - 1. Hardware shall be of best grade, entirely free of imperfections in manufacture and finish, and shall satisfactorily perform various functions needed.
  - 2. Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with UL labels or as otherwise accepted to Architect / Owner. Manufacturer's identification shall be permitted on rim of lock cylinders only.
  - 3. Furnish necessary screws, bolts, or other fastenings of suitable size and type to anchor hardware in position and match hardware as to material and finish. Provide Phillips flat-head screws except as otherwise indicated.
  - 4. Do not use through-bolts for installations where bolt head or nut opposite face is exposed in other work. Use of sex bolts shall not be allowed.
  - 5. Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as indicated. Items of hardware not definitely specified, but needed for satisfactory installation of hardware

shall be provided. Such items shall be of type and quality suitable for service needed and comparable to adjacent hardware.

6. Finishes shall comply with ANSI A156.18/ BHMA 1301.

B. Hinges: ANSI A156.1/ BHMA 101

1. Provide full mortise, template, 5-knuckle, heavy duty, button tip hinges with non-rising loose pins and ball type bearings.

2. Out-swinging exterior doors shall be furnished with solid bronze or stainless steel, extra heavy weight hinges with non-removable pins or security studs.

3. Interior doors with locksets shall be furnished with non-removable pins hinges.

5. Furnish hinges of sufficient throw where needed to clear trim or permit doors to swing 180°.

6. Products:

- a. Hager .....BB1199 ..... BB1168
- b. McKinney ....T4B3386 ..... T4B3786
- c. Ives .....5BB1HW ..... 5BB1HW

C. Locks and Latchsets:

1. Heavy-duty mortise locksets and latchsets, levers shall conform to ANSI A156.13/ BHMA 621 Series 1000 and, Operational Grade 1. Functions and lever design shall be as listed in schedule.

a. Latchbolt to be 3/4", stainless steel with anti-friction tongue and 1" stainless steel deadbolt with hardened steel roller inserts.

b. Hand of lock is to be easily field reversible without opening lock body case.

c. Lever trim is to be thru-bolted through door and lock case.

d. Cylinder collars for mortise locks to be cast.

2. Cylinders are to be small format removable core type. Per hardware set, cylinders are to be furnished with construction cores, keyed alike, with 5 construction master keys and 1 construction control key.

3. Provide manufacturer's standard wrought box strike for each latchset and lockset with curved lip extended to protect frame. Finish shall match hardware set.

4. Where rabbeted door stiles are indicated, provide special rabbeted front on locksets, latchsets, and bolts.

5. Finish: BHMA #626 US26D

6. Functions:

- |    |           |         |         |
|----|-----------|---------|---------|
| a. | passage   | L9010   | ML2010  |
| b. | privacy   | L9040   | ML2060  |
| c. | entrance  | L9453   | ML2067  |
| d. | classroom | L9070   | ML2055  |
| e. | storeroom | L9080   | ML2057  |
| f. | electric  | L9080EU | ML22905 |

7. Products:

- a. Schlage L9000 06N trim
- b. Corbin-Russwin ML2000 NSM trim

D. Exit Devices: ANSI A156.3/ BHMA 701, Grade 1

1. Exit devices shall be listed by UL for accident and hazard. Devices shall conform to ANSI A156.3, Grade 1 and conform to NFPA 80 and NFPA 101.

2. All devices shall carry a three-year warranty against manufacturing defects and workmanship.

3. All devices shall be through-bolt mounted on door.

4. Furnish required filler plates and shim kits for flush mounting of devices on all doors.

5. Provide touch bars with return stroke fluid dampers and rubber bottoming dampers, plus anti-rattle devices.

6. Touch pad shall extend a minimum of ½ of the door width. Touch pad height shall exceed height of mechanism case or rail assembly (T-Shaped) to eliminate pinch parts. If touch pad height does not exceed height of mechanism case/rail assembly, provide insert/filler on top and bottom of touch pad along mechanism case/rail to prevent pinch part. Provide stainless steel touch pads. Plastic touch pads are not acceptable.
  7. End caps shall be of heavy-duty metal alloy construction and provide horizontal adjustment to provide flush alignment with device cover plate. When device end cap is installed, no raised edges will protrude.
  8. All surface strikes shall be roller type and come complete with a locking plate underneath to prevent movement. Devices shall have dead latching feature to prevent latchbolt tampering.
  9. Devices shall not have any exposed rivets or screws on back of device that could be seen through a glass light.
  10. Surface vertical rod devices shall be UL labeled for fire door applications without the use of bottom rod assemblies.
  11. Outside trim shall be heavy-duty type with a breakaway feature to limit damage to the unit from vandalism and fastened by means of concealed welded lugs and through-bolts from inside. Trim shall be forged brass with a minimum average thickness on the escutcheon of .130". Pull plate with trim shall be brass with minimum average thickness of .090" and have forged pulls.
  12. Latch bolts shall have a self-lubricating coating, which reduces friction and wear. Plated latch bolts are unacceptable.
  13. Products as follows:
    - a. 99 Series - No substitution will be allowed.
- E. Overhead Closers: ANSI A156.4/ BHMA 301, Grade 1
1. Shall conform to ANSI A156.4, Grade 1, NFPA 80, NFPA 101 and UL10C.
  2. Full rack-and-pinion type closer with full complement bearings, single piece forged piston, chrome silicon steel spring, non-critical screw valves; back check, sweep and latch.
  3. ISO 9000 certified. Units stamped with date of manufacturer code.
  4. Closer body to be cast iron.
  5. Locate Closers on interior side of exterior doors and on the non-public side of interior doors, unless otherwise specified.
  6. Closers to be non-sized, field adjustable from size 1 to 6. Furnish all non-sized closers with 1½" diameter piston.
  7. Do not through-bolt if there has been special blocking specified in the wood door specification. Coordinate with the wood door specification.
  8. Provide plates, brackets and special templates when needed for interface with particular header, door and wall conditions and adjacent hardware.
  9. Maximum opening force to meet ADA: Exterior doors 8.5-lb.; interior doors-5 lb.; fire doors-15 lb.
  10. Manufacturer's heaviest duty arm available at doors scheduled with parallel arm applications.
  11. Closers tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
  12. Closers to have a cold weather fluid withstanding temperature range if 120 degrees to-30 degrees hydraulic fluid
  13. Closer products with any type of pressure relief valve system will not be acceptable.
  14. Products as follows:
    1. 4041 Series - No substitution will be allowed.
- F. Flushbolts: ANSI A156.16/ BHMA 1201
1. Provide minimum 1/2" diameter rods of brass or stainless steel, with minimum 12" long rods for doors up to 7'-0" in height. Provide longer rods as needed for doors exceeding 7'-0" in height.

2. Provide dustproof strikes for bottom flushbolt applications, except where special threshold construction provides non-recessed strike for bolt.
  3. Finish: BHMA #630 (US32D)
  4. Products:

	<u>Wood Doors</u>	<u>Hollow Metal Doors</u>
a.	Ives .....FB358 .....	FB458
b.	Hager .....283D .....	282D
c.	Trimco.....3913 .....	3917
- G. Combination Flushbolts: ANSI A156.16/ BHMA 1201
1. Provide combination flushbolts, using one automatic flushbolt for bottom of door and one constant, self-latching flushbolt for top of door. When active leaf is opened, bottom automatic flushbolt is opened. However inactive leaf stays latched at top until it is manually released. Top bolt engages each time inactive leaf is closed.
  2. Provide dust-proof strikes for bottom flushbolt applications.
  3. Finish: BHMA #630 (US32D)
  4. Products:

	<u>Wood Door</u>	<u>Hollow Metal Doors</u>
a.	Ives .....FB41P/FB42.....	FB31P/FB32
b.	Hager .....291D.....	292D
c.	Trimco.....3815 .....	3810
- H. Push and Pull Plates, Pull Bars, and Grips: ANSI A156.6/ BHMA 1001
1. Provide concealed mounting where possible. Where exposed fasteners are used, they shall be countersunk.
  2. Push plates shall be beveled on four edges.
  3. Where applicable push plates shall be prepared to receive cylinder locks or thumb turns as scheduled.
  4. Finish: BHMA #630 (US32D)
  5. Push Plates:
    - a. Size: 4" x 16"
    - b. Thickness (US GA): 18 gauge; .050"
    - c. Products:
      - 1) Hager - 30S
      - 2) Ives - 8200
      - 3) Trimco - 1001-3
  6. Pull Plates:
    - a. Size: 4" x 16"
    - b. Thickness (US GA): 18 gauge; .050"
    - c. Products:
      - 1) Ives – 8303-8
      - 2) Hager – 34G
      - 3) Trimco – 1018-3
  7. Pull Bars: Offset "D" pull
    - a. Size: 1" diameter
    - b. Projection: 2 1/2"
    - c. Mounting: 10" center to center
    - d. Products:
      - 1) Trimco - 1737
      - 2) Hager – 159
      - 3) Ives – 9190-10
- I. Door Protection Devices: ANSI A156.6/ BHMA 1001
1. Plates shall be furnished for concealed mounting where possible. Where exposed fasteners are used, they shall be countersunk.



2. Plates shall be beveled on three edges.
  3. Thickness (US GA): 18 gauge; .050"
  4. Finish: BHMA #630 (US32D)
  5. Kick Plates:
    - a. Size: 8" x 2" Less Door Width, unless otherwise listed
    - b. Products:
      - 1) Hager - 193S-B3E
      - 2) Ives - 8400-B3E
      - 3) Trimco - K0050-B3E
- J. Auxiliary Hardware: ANSI A156.16/ BHMA 1201
1. Silencers:
    - a. Tamper proof resilient cushions designed to absorb shock and noise.
    - b. Furnish door silencers at openings without gaskets. Provide 3 silencers per single door, and 2 for pairs of doors.
    - c. Products:

	<u>Metal Frames</u>	<u>Wood Frames</u>
1) Hager - .....	307D.....	308D
2) Ives - .....	SR64 .....	SR65
3) Trimco - .....	1229A.....	1229B
  2. Wall Bumpers: Cast Brass, 2 1/2" diameter; 1" nominal projection
    - a. Finish: BHMA #626 (US26D)
    - b. Products:
      - 1) Ives - 402 CCV
      - 2) Hager - 234W
      - 3) Trimco - 1276CCS
  3. Concealed Overhead Holders/Stops:
    - a. Description: Low profile heavy-duty extruded brass or bronze holders with shock absorber and no plastic parts
    - b. Overall channel depth shall not exceed 3/4".
    - c. Finish: BHMA #630 (US32D)
    - d. Products:
      - 1) ABH - 3020 Series
      - 2) GJ - 410 Series
  4. Surface Mounted Overhead Holders/Stops:
    - a. Description: Heavy-duty extruded brass, bronze, or stainless steel holders with shock absorber and no plastic parts
    - b. Finish: BHMA #630 (US32D)
    - c. Products:
      - 1) ABH - 9000 Series
      - 2) GJ - 90 Series
    - d. Description: Medium duty extruded brass, bronze or stainless steel holders with shock absorber and no plastic parts
    - e. Finish: BMHA #630 (US32D)
    - f. Products:
      - 1) ABH - 3300 series
      - 2) GJ - 450 series
- K. Coordinators: ANSI A156.3, type 21A
1. Products:
    - a. Ives - COR x FB x mounting brackets as required
    - b. Trimco - 3094B1 x 3094-1 x 3096
    - c. Hager - 297D x 297F x 297N

- L. Seals and Gaskets: ANSI A156.22
  - 1. Seals and gaskets shall be continuous and without unnecessary interruptions at door corners and hardware. Provide components which shall not become ineffective as seals due to misalignment at corners, minor out-of-adjustment of doors and frames, temperature variations, and normal wear and aging.
  - 2. Smoke Seals:
    - a. Products:
      - 1) NGP – 2525B
      - 2) Pemko - S88B
  - 3. Automatic Drop Seal Door Bottoms:
    - a. Provide automatic drop seal unit of manufacturer's standard design, with operating seal bar capable of operating to close a 3/4" gap.
    - b. Mounting: Mortised at center of door
    - c. Units scheduled to drop onto pile-type carpet flooring shall be provided with a pointed edge (45° bevel from both sides) on bottom of seal contact strip.
    - d. Products:
      - 1) NGP - ..... 423N
      - 2) Pemko - .. 430 series
  - 4. Weatherstripping at head and jambs:
    - a. Products:
      - 1) NGP – 700SA/head;160SA/jambs
      - 2) Pemko – 2891AS/head;303AS/jambs
- M. Thresholds: Extruded aluminum; 6063-T5 alloy; ANSI A156.21
  - 1. Thresholds shall extend full width of opening. Miter both ends of threshold as necessary to suit Project conditions.
  - 2. Products:
    - a. NGP – 424E
    - b. Pemko – 170A
- N. Magnetic Door Holder:
  - 1. Product:
    - a. LCN – SEM7840/50 x 120V
- O. Automatic Operators and HC Push Pad
  - 1. Products
    - a. Horton 4100LE x BEA interface module
    - b. Sedco 59H

## 2.03 ELECTRO-MECHANICAL HARDWARE

- A. General Requirements:
  - 1. Coordinate installation of electro-mechanical hardware to insure proper size wire is used to power load(s).
    - a. Voltage drop shall not exceed 5% of load's stated voltage.
    - b. Voltage drop shall be calculated by first determining resistance of load ( $R=E/I$  voltage divided by AMP draw). Next, determine resistance of wire (per below chart). Divide this number by resistance of load. If result exceeds 5%, wire thickness shall be increased.
    - c. Wire length shall equal distance to load and back to supply (Lock 50 ft. from power supply; wire length = 100 ft.). Two loads powered by one pair of wires draw double current and have half (50%) of resistance.

<u>Wire Size</u>	<u>Resistance Per 1,000 Feet</u>
12 Gauge	1.6 OHM
14 Gauge	2.5 OHM
16 Gauge	4.1 OHM
18 Gauge	6.4 OHM
20 Gauge	10.1 OHM
22 Gauge	16.0 OHM

2. Furnish electromechanical hardware with power supply units, junction boxes, and other accessories needed for a complete, efficient installation.
  3. Power Supply Units:
    - a. Power supply units shall be designed for electromagnetic locks, electric locking or monitoring exit devices, and/or electric strikes as needed.
    - b. Output power shall be field selectable for either 24 volts DC at 1 ampere or 12 volts DC at 2 amperes. Input power shall be 120 volts AC at 0.6 ampere, unless otherwise indicated.
    - c. Units shall have a terminal block that shall accept 14 gauge stranded wire.
    - d. Enclosure shall be not less than 10" x 10" x 4" deep, constructed of 19 gauge steel with a hinged cover. Provide not less than six, 1/2" knock-out holes for conduit connection.
  4. Junction Boxes: NEMA 1
    - a. Boxes shall be surface mounted units not less than 10" x 10" x 6" deep with a hinged door equipped with a twist turn lock.
    - b. Junction boxes shall have a 20 position terminal strip that shall accept from 24 gauge to 12 gauge wire.
  5. Power Transfer Devices:
    - a. Provide a means to transfer power from frame to door stile. Devices shall be reversible and allow a full 180° door swing with 4 1/2" x 4 1/2" butt hinges or 3/4" offset pivots. When door is in closed position, transfer unit shall be concealed.
    - b. Transfer units shall contain ten 24 AWG UL approved conductors.
    - c. Rating: 10 Amps at 24 vdc (Class 1 low voltage)
- B. Electro-Mechanical Locksets:
1. Electro-mechanical locks shall comply with requirements for size, quantity, type, etc., as set forth for non-electric locks and shall conform to ANSI A156.23. Locks shall be UL listed for labeled doors.
  2. Solenoids used in electro-mechanical locks shall meet UL requirements for cycle life, low operating temperature and shock and fire hazard qualifications; and be designed for intermittent and continuous duty.
    - a. Power Requirements: 1.0 amps; 24 VAC/DC
  3. Provide fail secure function, operates as passage set when energized, unless otherwise indicated.
- C. Electro-Mechanical Exit Devices:
1. Electro-mechanical exit devices shall comply with requirements for size, quantity, type, etc., as set forth for non-electric devices. Exit devices shall be UL listed for labeled doors.
  2. Solenoids used in electro-mechanical locks shall meet UL requirements for cycle life, low operating temperature and shock and fire hazard qualifications; and be designed for intermittent and continuous duty.
    - a. Power Requirements: 24 vdc
  3. Provide following functions as scheduled:

- a. Fail Safe Function: Operates as passage set when de-energized
- b. Latch Retraction: Upon signal units latch retracted (unlocks)
1. Products: Refer to Hardware Schedule below

2.04 CYLINDERS, KEYING SYSTEMS AND KEY CONTROL

- A. Furnish 1 key per each lock, 1 master key, 5 construction master keys, 1 construction control key and 1 permanent control key.
- B. All cylinders are to be supplied with brass construction master keyed temporary cores.
- C. Permanent cylinder cores are to be furnished to the owner either "0" bitted for the owner to master key or factory master keyed as directed by owner. The owner will advise at pre-construction meeting.
- D. All permanent cores will be furnished in the keyway as directed by the owner.
- E. Hardware supplier to meet with owner to determine the final master key information, such as, keyed different or keyed alike sets and sub-masters required. The keyway information will also be available at that time.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Site Verification of Conditions:
  1. Examine doors, frame, and related items for conditions that would prevent proper application of hardware.
  2. Correct conditions detrimental to timely and proper execution of Work.
  3. Do not proceed until unsatisfactory conditions have been corrected.
  4. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

- A. General Requirements:
  1. Securely install finish hardware items in compliance with accepted schedule and templates furnished with hardware.
  2. Provide metal fasteners of type and size which will not work loose as a result of normal door use, and which are compatible with metal materials of hardware item and doors and frames. Provide only smooth exposed fastener heads, which do not constitute a snagging hazard to clothing. Finish of exposed fasteners shall match finish of hardware item.
  3. Install mortised items flush with adjacent surfaces.
  4. Install locksets, surface mounted closers, and trim after finishing of doors and frames is complete. Wherever cutting and fitting is needed to install hardware onto or into surfaces which are later to be finished, install each item completely and then remove and store in a secure place during finish application. After completion of finishes, reinstall each item.
  5. Locate items in compliance with Door and Hardware Institute publication WDHS.3 *Recommended Hardware Locations for Wood Flush Doors*. Mounting heights shall be measured from finish floor, except top butt.
    - a. Butts:
      - 1) Top: 9 5/8" center of butt to top of door
      - 2) Intermediate: Equal distance between top and bottom butts
      - 3) Bottom: 10 3/8" to center of butt
    - b. Locksets and latchesets: 40 5/16" to center of strike
    - c. Deadlocks: 60" to center of strike
    - d. Exit Devices: 40 5/16" to center of strike
    - e. Push Plates: 45" to center

f. Pull Bars (Grips): 42" to center

B. Interior Stops:

1. Door stops shall be furnished for every door leaf. Install floor-mounted or wall-mounted stops, as scheduled. Overhead door holder shall be provided where floor or wall stops cannot be used.
2. Place door stops in such a position that they permit maximum door swing, but do not present a hazard or obstruction. Furnish floor strikes for floor holders of proper height to engage holders of doors.

C. Electro-Mechanical Hardware:

1. Comply with manufacturer's instructions for wiring, grounding, and shielding.

3.03 FIELD QUALITY CONTROL

A. Owner's Field Service:

1. Owner will make periodic site visits to monitor progress and compliance of installation requirements. Any defects will be noted and shall be corrected in five business days.

B. Operational Test:

1. After installation of fire doors is completed, operational tests shall be conducted on each door.
2. Tests shall be adequate to determine that system has been installed and functions as intended.

3.04 ADJUSTING

A. Final Adjustment:

1. Before final completion, adjust hardware so doors operate in perfect order. Test and adjust hardware for quiet, smooth operation, free of sticking, binding, or rattling. Adjust closers for proper, smooth operation.
2. Exposed hardware shall be carefully cleaned by methods not injurious to finish, immediately preceding occupancy. Replace defective, damaged, or missing hardware.
3. At final completion, properly tag and identify keys and deliver to Owner.

3.05 HARDWARE SCHEDULE

HW SET: 01 Interior - Office – Mortise Lockset - Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	ENTRANCE LOCK	L9453BD x 06N	626	SCH
3	EA	SILENCER	SR64	GRY	IVE
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE

HW SET: 02 Interior - Storeroom – Mortise Lockset - Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	STOREROOM LOCK	L9080BD x 06N	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
3	EA	SILENCER	SR64	GRY	IVE

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1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE

HW SET: 03 Interior - Storeroom - Mortise Lockset - Pair of Doors

6	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2 NRP	652	HAG
1	EA	STOREROOM LOCK	L9080BD 06N	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	SILENCER	SR64	GRY	IVE
2	EA	WALL BUMPER	WS406CCV	630	IVE
2	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
2	EA	MANUAL FLUSH BOLT	FB 458 x DP2	626	IVE

HW SET: 04 Interior - Classroom – Mortise Lockset - Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	CLASSROOM LOCK	L9070BD x 06N	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE

HW SET: 05 Interior - Classroom – Exit Device - Pair of Doors

6	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	MULLION	KR4954 x 154 STABLIZERS	689	VON
1	EA	PANIC DEVICE	LD - 99L x 996L x RHR	626	VON
1	EA	PANIC DEVICE	LD - 99EO x 996EO x LHR	626	VON
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH
2	EA	SURFACE CLOSER	4041 SCNS	689	LCN
2	EA	SILENCER	SR64	GRY	IVE
2	EA	WALL BUMPER	WS406CCV	630	IVE
2	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE

HW SET: 06 Interior - Passage – Mortise Lockset - Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	PASSAGE LATCH	L9010 x 06N	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE

HW SET: 07 Interior - Bathroom – Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	PUSH PLATE	8200 4 X 16	630	IVE
1	EA	PULL PLATE	8303-8 4 X 16	630	IVE
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	EA	CLASSROOM DEADBOLT	B663 x BD	626	SCH

HW SET: 08 Interior - Unisex Bathroom – Mortise Lockset - Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	BATHROOM LOCK	L9496BD x 06L	626	IVE
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Note: Lock not available in N escutcheon, use the L escutcheon only

HW SET: 09 Interior - Fire Rated - Card Reader – Exit Device – Single Door

3	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	ELEC POWER TRANSFER	EPT-10	689	VON
1	EA	FIRE EXIT DEVICE	99L-F x E996L	626	VON
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	WALL BUMPER	WS406CCV	630	IVE
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	SET	SEAL	2525B HEAD & JAMBS		NGP
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	POWER SUPPLY	PS 914-8F-FA	GRY	VON

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 10 Interior - Fire Rated - Card Reader - Exit Device – Pair of Doors

1	EA	ELEC POWER TRANSFER	EPT - 10	SP28	VON
6	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2	652	HAG
1	EA	MULLION	KR9954 x 499F x 154 STABILIZERS	689	VON
1	EA	FIRE EXIT DEVICE	99L-F x E996L x RHR	626	VON
1	EA	FIRE EXIT DEVICE	99EO-F x 996EO x LHR	626	VON
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH

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1	SET	ASTRAGAL FIRE SEAL	9500		GRY	NGP
2	EA	SURFACE CLOSER	4041 SCNS		689	LCN
2	EA	WALL BUMPER	WS406CCV		630	IVE
2	EA	KICK PLATE	8400-B3E 8 X 1 LDW		630	IVE
1	SET	SEAL	2525B HEAD & JAMBS			NGP
1	EA	POWER SUPPLY	PS914-8F-FA		GRY	VON

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 11 Interior - Fire Rated - Card Reader – Mortise Lockset – Single Door

1	EA	ELECTRIFIED HINGE	BB1168 x ETW 4-1/2 X 4-1/2 NRP		652	HAG
2	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2 NRP		652	HAG
1	EA	ELECTRIFIED LOCK	L9080EU-BD x 06N		626	SCH
1	EA	SURFACE CLOSER	4041 EDA		689	LCN
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW		630	IVE
1	EA	WALL BUMPER	WS402CCV		630	IVE
2	SET	SEAL	2525B HEAD & JAMBS			NGP
1	EA	POWER SUPPLY	PS 914-8F		GRY	VON

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 12 Interior - Fire Rated - Cross Corridor – Exit Device - Pair of Doors

2	EA	KICK PLATE	8400-B3E 8 X 1 LDW		630	IVE
1	EA	GASTING	9600 DKB			NGP
2	SET	SEAL	2525B HEAD & JAMBS			NGP
6	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2		652	HAG
2	EA	FIRE EXIT DEVICE	9547 L – F - LBR x LP373L - BE		626	VON
2	EA	SURFACE CLOSER	4041 SCNS		689	LCN
2	EA	MAGNETIC HOLD OPEN	SEM7850	AL	LCN	

NOTE: INPACT DOOR SYSTEM

HW SET: 13 Interior - Card Reader – Mortise Lockset - Single Doors

1	EA	ELECTRIFIED HINGE	BB1168 x ETW 4-1/2 X 4-1/2 NRP		652	HAG
2	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2 NRP		652	HAG
1	EA	STOREROOM LOCK	L9080EU-BD x 06N		626	SCH
1	EA	SURFACE CLOSER	4041 EDA		689	LCN
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW		630	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WALL BUMPER	WS402CCV		630	IVE
1	EA	POWER SUPPLY	PS 914-8F		GRY	VON
1	EA	DOOR POSITION SWITCH	1087 X 1			

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS



HW SET: 14 Interior - Card Reader – Exit Device - Pair of Doors

6	EA	HINGE	BB1168 x NRP 4-1/2 X 4-1/2 NRP	652	HAG
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	MULLION	KR4954 X 154 STABLIZERS	689	VON
1	EA	PANIC DEVICE	LD -99 x E996L x RHR	626	VON
1	EA	PANIC DEVICE	LD - 99EO x 996EO x LHR	626	VON
2	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH
2	EA	SURFACE CLOSER	4041 SCNS	689	LCN
2	EA	KICK PLATE	8400-B3E 8 X 1 LDW	630	IVE
6	EA	SILENCER	SR64	GRY	IVE
1	EA	THRESHOLD	424E	628	NGP
1	EA	POWER SUPPLY	PS 914-8F	GRY	VON
2	EA	DOOR POSITION SWITCH	1087 x 1		LOC

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 15 Exterior - Card Reader – Mortise Lockset – Single Door

1	EA	ELECTRIFIED HINGE	BB1199 x ETW 4-1/2 X 4-1/2	630	HAG
2	EA	HINGE	BB1199 x NRP 4-1/2 X 4-1/2	630	HAG
1	EA	STOREROOM LOCK	L9080EU-BD x 06N	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	EA	WALL BUMPER	WS402CCV	630	IVE
2	SET	SEAL	2525B HEAD & JAMBS		NGP
1	EA	POWER SUPPLY	PS 914-8F	GRY	VON
1	EA	DOOR POSITION SWITCH	1078 X 1		

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 16 Exterior - Card Reader - Exit Device – Single Door

3	EA	HINGE	BB1199 x NRP 4-1/2 X 4-1/2	630	HAG
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	PANIC DEVICE	EL99NL x 990NL – R/V	626	VON
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	EA	WALL BUMPER	WS402CCV	630	IVE
2	SET	SEAL	2525B HEAD & JAMBS		NGP
1	EA	POWER SUPPLY	PS 914-2RS	GRY	VON
1	EA	DOOR POSITION SWITCH	1078 X 1		

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 17 Exterior Vestibule - Card Reader – Exit Device - Pair of Doors

6	EA	HINGE	BB1199 x NRP 4-1/2 X 4-1/2	630	HAG
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	MULLION	KR4954 X 154 STABLIZERS	689	VON
1	EA	PANIC DEVICE	EL99NL x 990NL – R/V x RHR	626	VON
1	EA	PANIC DEVICE	99EO x 990EO x LHR	626	VON
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH
2	EA	SURFACE CLOSER	4041 SCNS	689	LCN
2	EA	KICK PLATE	8400-B3E 8 X 1 LDW	630	IVE
1	EA	HEAD SEAL	700S	628	NGP
2	EA	JAMB SEAL	160S	628	NGP
1	EA	THRESHOLD	424E	628	NGP
1	EA	POWER SUPPLY	PS 914-2RS	GRY	VON
2	EA	DOOR POSITION SWITCH	1078 x 1		SEN

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 18 Interior Vestibule – Non Locking Exit Device - Pair of Doors

6	EA	HINGE	BB1199 4-1/2 X 4-1/2 NRP	630	HAG
2	EA	DUMMY PANIC DEVICE	330 DT	626	VON
2	EA	SURFACE CLOSER	4041 SCNS	689	LCN
2	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	EA	HEAD SEAL	700S	628	NGP
2	EA	JAMB SEAL	160S	628	NGP
1	EA	RAIN DRIP	17D	628	NGP
1	EA	THRESHOLD	424E	628	NGP

HW SET: 19 Exterior Vestibule – Automatic Operator - Card Reader – Exit Device - Pair of Doors

1	EA	POWER TRANSFER	EPT10	689	VON
6	EA	HINGE	BB1199 x NRP 4-1/2 X 4-1/2	630	HAG
1	EA	PANIC DEVICE	EL99NL x 990NL – R/V x RHR	626	VON
1	EA	PANIC DEVICE	99EO x 990EO x LHR	626	VON
1	EA	MULLION	KR4954 x 154 STABLIZERS	689	VON
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	SURFACE CLOSER	4041 SCNS	689	LCN
1	EA	AUTO OPERATOR	4100LE	689	HOR
1	SET	LOCK INTERFACE MOD	MC25 X EL24VDC RELAY		BEA
3	EA	HC PUSH PAD SWITCH	59H	630	SED
2	EA	KICK PLATE	8400-B3E 8 X 1 LDW	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

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1	EA	POWER SUPPLY	PS 914-2RS	GRY	VON
2	EA	DOOR POSITION SWITCH	1087 x 1		SEN

NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

HW SET: 20 Interior Vestibule – Automatic Operator – Non Locking Exit Device – Pair of Doors

6	EA	HINGE	BB1199 4-1/2 X 4-1/2 NRP	630	HAG
2	EA	DUMMY PANIC DEVICE	330 DT	626	VON
1	EA	SURFACE CLOSER	4041 SCNS	689	LCN
2	EA	KICK PLATE	8400-B3E 8 X 2 LDW	630	IVE
1	EA	HEAD SEAL	700S	628	NGP
2	EA	JAMB SEAL	160S	628	NGP
1	EA	RAIN DRIP	17D	628	NGP
1	EA	THRESHOLD	424E	628	NGP
2	EA	DOOR POSITION SWITCH	679-05		LOC
1	EA	AUTO OPERATOR	4100LE	689	HOR
1	SET	LOCK INTERFACE MOD	MC65		BEA
2	EA	HC PUSH PAD SWITCH	59H	630	SED

HW SET: 21 Overhead Roll Up Door

1	EA	DOOR POSITION SWITCH	674-OH		SCE
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NOTE: CARD READER AT SELECTED LOCATIONS BY OTHERS

NOTE: AUTOMATIC TIMER CONTROL TO CLOSE THE DOOR WHEN BUILDING SECURED

End of Section

## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
  - 3. Storefront framing.
  - 4. Interior borrowed lites.
- B. Related Sections:
  - 1. Division 08 Section "All-Glass Entrances and Storefronts."

#### 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
  - 1. Tinted glass.
  - 2. Patterned glass.
  - 3. Coated glass.
  - 4. Fire-resistive glazing products.
  - 5. Laminated glass with colored interlayer.
  - 6. Insulating glass.
  - 7. Tempered glass.
- C. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency, and sealant testing agency.
- G. Product Certificates: For glass and glazing products, from manufacturer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants, and glazing gaskets.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- I. Preconstruction adhesion and compatibility test report.
- J. Warranties: Sample of special warranties.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

- C. Source Limitations for Glass: Obtain ultraclear float glass, tinted float glass, coated float glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.
- D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- F. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- G. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

## 1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance

Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent and solar heat gain coefficient not less than 0.87.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. AFG Industries, Inc.; Krystal Klear.
    - b. Guardian Industries Corp.; Ultrawhite.
    - c. Pilkington North America; Optiwhite.
    - d. PPG Industries, Inc.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  2. For uncoated glass, comply with requirements for Condition A.
  3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- D. Ceramic-Coated Vision Glass: Heat-treated float glass, Condition C; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.

## 2.3 LAMINATED GLASS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



1. Monsanto Co.
  2. E.I. DuPont De Nemours & Co., Inc.
- B. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.
- 2.4 INSULATING GLASS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Viracon.
  2. Approved equal.
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard, primary and secondary.
  2. Spacer: Manufacturer's standard spacer material and construction.
  3. Desiccant: Molecular sieve or silica gel, or blend of both.
- C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.
- 2.5 FIRE-PROTECTION-RATED GLAZING
- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
- B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch (5-mm) nominal thickness.
1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Ashai Glass Co./Ama Glass Corp.
    - b. Central Glass Co., Ltd.
    - c. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); Obscure FireLite, Premium FireLite, or Standard FireLite.

- d. Pilkington Glass Ltd.
  - e. Vetrotech Saint-Gobain; SGG Keralite FR-R.
- C. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch (8-mm) total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Ashai Glass Co./Ama Glass Corp.
    - b. Central Glass Co., Ltd.
    - c. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); Obscure FireLite, Premium FireLite, or Standard FireLite.
    - d. Pilkington Glass Ltd.
    - e. Vetrotech Saint-Gobain; SGG Keralite FR-R.
- D. Fire-Protection-Rated Tempered Glass: 1/4-inch- (6.4-mm-) thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials.
- 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; PyroEdge-20.
    - b. Safti First; SuperLite20.
    - c. Vetrotech Saint-Gobain; SSG Pyroswiss.
- E. Fire-Protection-Rated Laminated Glass: 5/16-inch- (8-mm-) thick, fire-protection-rated laminated glass, complying with testing requirements in 16 CFR 1201 for Category II materials.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Oldcastle Glass, Inc.; Pyroguard.
- F. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.
    - b. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.
    - c. Vetrotech Saint-Gobain; SGG Contraflam N2 SGG Swissflam N2.

## 2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
  2. EPDM complying with ASTM C 864.
  3. Silicone complying with ASTM C 1115.
  4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

## 2.7 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
  4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Building Systems.
    - b. Dow Corning Corporation; 790.
    - c. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - d. May National Associates, Inc.; Bondaflex Sil 290.
    - e. Pecora Corporation; 864, 890.
    - f. Sika Corporation, Construction Products Division; SikaSil-C990.
    - g. Tremco Incorporated; Spectrem 1.
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

## 2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product

manufacturer and referenced glazing publications, to comply with system performance requirements.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

#### 2.11 MONOLITHIC-GLASS TYPES

- A. Glass Type: Clear float glass.
  - 1. Thickness: 6.0 mm.
- B. Glass Type GL- $\langle\#\rangle$ : Ceramic-coated vision glass, heat-strengthened float glass, fully tempered float glass.
  - 1. Thickness: 6.0 mm.
  - 2. Coating Location: Second surface.
  - 3. Winter Nighttime U-Factor: 0.86 maximum.
  - 4. Summer Daytime U-Factor: 0.75 maximum.
  - 5. Solar Heat Gain Coefficient: 0.34 maximum.
  - 6. Provide safety glazing labeling.

#### 2.12 LAMINATED-GLASS TYPES

- A. Glass Type: Clear laminated glass with two plies of fully tempered float glass.
  - 1. Thickness of Each Glass Ply: As indicated.
  - 2. Interlayer Thickness: 0.060 inch (1.52 mm).
  - 3. Provide safety glazing labeling.

#### 2.13 INSULATING-GLASS TYPES

- A. Glass Type: Clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch (25 mm).
  - 2. Thickness of Each Glass Lite: 6.0 mm.
  - 3. Outdoor Lite: Float glass, Fully tempered float glass, where required at glazed exterior doors.
  - 4. Interspace Content: Air.
  - 5. Indoor Lite: Float glass, Fully tempered float glass, where required at glazed exterior doors.
  - 6. Provide safety glazing labeling.
- B. Glass Type: Low-e-coated, clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch (25 mm).

2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Float glass.
4. Interspace Content: Air.
5. Indoor Lite: Float glass.
6. Low-E Coating: Pyrolytic on second surface.
7. Visible Light Transmittance: 60 percent minimum.
8. Winter Nighttime U-Factor: 0.34 maximum.
9. Summer Daytime U-Factor: 0.35 maximum.
10. Solar Heat Gain Coefficient: 0.54% maximum.
11. Provide safety glazing labeling.

#### 2.14 FIRE-PROTECTION-RATED GLAZING TYPES

- A. Glass Type: 20-minute fire-rated glazing without hose-stream test; film-faced ceramic glazing, laminated ceramic glazing, fire-protection-rated tempered glass, or fire-protection-rated laminated glass.
  1. Provide safety glazing labeling.
- B. Glass Type: 20-minute fire-rated glazing with hose-stream test; monolithic ceramic glazing; film-faced ceramic glazing; laminated ceramic glazing; or gel-filled, double glazing units.
  1. Provide safety glazing labeling.
- C. Glass Type: 45-minute 60-minute 90-minute 120-minute fire-rated glazing; monolithic ceramic glazing film-faced ceramic glazing laminated ceramic glazing laminated glass with intumescent interlayers or gel-filled, double glazing units.
  1. Provide safety glazing labeling.
- D. Glass Type: 45-minute 60-minute 90-minute 120-minute fire-rated glazing with 450 deg F (250 deg C) temperature rise limitation; laminated glass with intumescent interlayers or gel-filled, double glazing units.
  1. Provide safety glazing labeling.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without



developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

### 3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

## SECTION 089000 - LOUVERS AND VENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Fixed, extruded-aluminum louvers.
2. Adjustable, extruded-aluminum louvers.
3. Adjustable, extruded-aluminum insulated louvers.
4. Fixed, formed-metal acoustical louvers.
5. Wall vents (brick vents).

- B. Related Sections:

1. Division 04 Section "Unit Masonry" for building wall vents (brick vents) into masonry.
2. Division 08 Section "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
3. Division 08 Section "Flush Wood Doors" for louvers in flush wood doors.
4. Division 09 Section "Exterior Painting" for field painting louvers.
5. Division 22 Section "General-Service Compressed-Air Piping" for connecting pneumatic-operated adjustable louvers.
6. Division 23 Sections for louvers that are a part of mechanical equipment.
7. Division 23 Section "Instrumentation and Control for HVAC" for electric, electronic, and pneumatic control of adjustable louvers.
8. Division 26 Sections for electrical power connections for motor-operated adjustable louvers.

#### 1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

- E. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
  - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
  - 2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa) [30 lbf/sq. ft. (1436 Pa) acting inward or outward.
- C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. Component Importance Factor is 1.5.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.
- E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- F. Acoustic Performance: Provide acoustical louvers complying with ratings specified, as demonstrated by testing manufacturer's stock units identical to those specified, except for length and width for airborne sound-transmission loss according to ASTM E 90 or outdoor-indoor sound-transmission loss according to ASTM E 966.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
  2. Show mullion profiles and locations.
  3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of metal finish required.
- E. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  2. AWS D1.3, "Structural Welding Code - Sheet Steel."
  3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.
- D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.
- E. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, No. 2B finish, with grain running parallel to length of blades and frame members  
Fasteners: Use types and sizes to suit unit installation conditions.
  - 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
  - 2. For fastening aluminum, use 300 series stainless-steel fasteners.
  - 3. For fastening galvanized steel, use 300 series stainless-steel fasteners.
  - 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
  - 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.2 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
  - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
  - 2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Interior flange unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.

- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
  - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
  - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
  - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
  - 4. Exterior Corners: Prefabricated corner units with mitered and welded blades and with recessed mullions at corners.
- G. Provide extended sills for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

### 2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal Storm-Resistant Louver:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Air Balance Inc.; a Mestek company.
    - b. All Lite- Metal Company.
    - c. Arrow United Industries; a division of Mestek, Inc.
    - d. Construction Specialties, Inc.
    - e. United Enertech Corp.
  - 2. Louver Depth: 5 inches (125 mm) or as noted.
  - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and 0.080 inch (2.03 mm) for frames.
  - 4. Louver Performance Ratings:
    - a. Free Area: noted on Drawings.
    - b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s).
    - c. Wind-Driven Rain Performance: 95percent effectiveness when subjected to a rainfall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core-area intake velocity of 400 fpm (2.0 m/s).
  - 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- B. Horizontal, Drainable-Blade Louver.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Air Balance Inc.; a Mestek company.
    - b. All-Lite Metal Company.
    - c. Arrow United Industries; a division of Mestek, Inc.
    - d. Construction Specialties, Inc.
    - e. United Enertech Corp.
  2. Louver Depth: 4 inches (100 mm) or as noted on Drawings.
  3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and 0.080 inch (2.03 mm) for frames.
  4. Mullion Type: Exposed.
  5. Louver Performance Ratings:
    - a. Free Area: noted on Drawings.
    - b. Point of Beginning Water Penetration: Not less than 1100 fpm (5.6 m/s).
    - c. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s).
    - d. Air Performance: Not more than 0.15-inch wg (37-Pa) static pressure drop at 1000-fpm (5.1-m/s)].
  6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- C. Horizontal, Continuous-Line, Drainable-Blade Louver: Drainable-blade louver with blade gutters (drains) in rear two-thirds of blades only and with semirecessed mullions capable of collecting and draining water from blades.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Arrow United Industries; a division of Mestek, Inc.
    - b. Construction Specialties, Inc.
    - c. Atlantic HVACR.
    - d. All-Lite Metal Company.
  2. Louver Depth: 6 inches (150 mm)] or as noted on Drawings.
  3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
  4. Louver Performance Ratings:
    - a. Free Area: As noted on Drawings.
    - b. Point of Beginning Water Penetration: Not less than 850 fpm (4.3 m/s).
    - c. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s).

## 2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
  2. Screen Location for Adjustable Louvers: Interior face unless otherwise indicated.
  3. Screening Type: Bird screening.



- B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.
  - 2. Finish: Same finish as louver frames to which louver screens are attached.
  - 3. Type: Rewirable frames with a driven spline or insert.
- D. Louver Screening for Aluminum Louvers:
  - 1. Bird Screening: Aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire.

## 2.5 BLANK-OFF PANELS

- A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
  - 1. Aluminum sheet for aluminum louvers, not less than 0.050-inch (1.27-mm) nominal thickness.
  - 2. Galvanized-steel sheet for galvanized-steel louvers, not less than 0.052-inch (1.32-mm) nominal thickness.
  - 3. Stainless-steel sheet for stainless-steel louvers, not less than 0.050-inch (1.27-mm) nominal thickness, with grain running in same direction as grain of louver blades.
  - 4. Panel Finish: Same finish applied to louvers.
  - 5. Attach blank-off panels with sheet metal screws.
- B. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.
  - 1. Thickness: 2 inches (50 mm).
  - 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
  - 3. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028-inch (0.71-mm) nominal thickness.
  - 4. Metal Facing Sheets: Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness.
  - 5. Insulating Core: Extruded-polystyrene foam.
  - 6. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard frames, with corners mitered and with same finish as panels.
  - 7. Seal perimeter joints between panel faces and louver frames with gasket or clear silicone sealant.
  - 8. Panel Finish: Same finish applied to louvers.
  - 9. Attach blank-off panels with sheet metal screws.

## 2.6 WALL VENTS (BRICK VENTS)

### A. Cast-Aluminum Wall Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
  - a. Hohmann & Barnard, Inc.
  - b. Sunvent Industries; Division of Sylro Sales Corp.
  - c. Empire Ventilation Equipment Company.
2. One-piece, cast-aluminum louvers and frames; with 18-by-14- (1.4-by-1.8-mm-) mesh, aluminum insect screening on inside face; incorporating integral waterstop on inside edge of sill; of load-bearing design and construction.
3. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless-steel components.
4. Finish: As noted on Drawings.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

## 2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  1. Color: As selected by Architect from full range of industry colors and color densities.
- D. Conversion-Coated Finish: AA-C12C42 (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating).
  1. Organic Coating: Air-dried primer of not less than 2-mil (0.05-mm) dry film thickness.
- E. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2604 AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  1. Color and Gloss: As selected by Architect from manufacturer's full range satin finish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

#### 3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

#### 3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000